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tumor formation in plants may be wrong because they failed to recognize the polar disposition to callus formation. He thinks the studies on tumor formation in plants will finally throw much light on cancer development.—WM. CROCKER.

Effect of illuminating gas on plants.—WEHMER[10] has studied the effect of passing continuous streams of illuminating gas through the soil bearing potted herbaceous as well as 3–7-year-old woody plants. There was a great difference in the amount of injury, according to the stage of development. In the spring the trees were entirely killed in a relatively short time. This is in general the sort of reaction given by the actively growing herbaceous forms at all times. In late summer and early fall the injury is less marked and is shown mainly by leaf fall, while in the dormant period of winter the trees are very resistant. In the cress the embryo in the resting seed and the seedling stage proved very sensitive. Cuttings stood in gas-impregnated water showed, with few exceptions (*Ilex*), seasonal variations in sensitiveness similar to the plants rooted in soils. In spite of this the author thinks that injury to parts above the soil is in part a secondary result of root injury. The injury is due to toxic conditions of the gas and not to mere displacement of oxygen by the gas, as SORAUER has suggested. The toxic constituents increase or decrease with the conditions that lead to an increase or a decrease in the odor-producing materials. A later paper on the toxic constituents is promised. The author seems to have overlooked most of the literature on the effect of illuminating gas on plants.—WM. CROCKER.

Aeration systems of leaves.—NEGER[11] has earlier spoken of 2 types of leaves on the basis of the nature of their intercellular systems, heterobaric and homobaric. In a recent article he compares a heterobaric leaf to a house with thousands of rooms lacking communicating doors, and a homobaric leaf to a similar house with communicating doors present and all open. In the first type the intercellular system is divided into many small isolated regions by the smaller veins, with the resulting possibility of different air pressure existing in each; while in the second the whole intercellular system of the leaf is connected and therefore the same pressure exists throughout. Most plants with flat leaves have heterobaric leaves, and the size of the individual chambers varies considerably. In various species of *Quercus* they run from 1/840 to 1/1400 sq. cm., and in *Syringa vulgaris* from 1/8 to 1/10 sq. cm. In the same species shade leaves have larger chambers than sun leaves. The following trees and shrubs have homobaric leaves: *Evonymus japonica*, *Ilex aquifolium*,

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[10] WEHMER, C., Leuchtgaswirkung auf Pflanzen. 4. Die Wirkung des Gases auf das Wurzelsystem von Holz-pflanzen; Ursache der Gaswirkung. Ber. Deutsch. Bot. Gesells. **36**:140–144. 1918.

[11] NEGER, F. W., Die Wegsamkeit der Laubblätter für Gaze. Festschrift zum ERNST STAHL. pp. 152–161. Jena. 1918.

Prunus Laurocerasus, *Hedera Helix*, *Ardisia crispa*, and all needle bearing trees and shrubs. When injured by smoke the homobaric leaves show the injury to the whole leaf due to the gases distributing themselves throughout the whole intercellular system, while the heterobaric leaves show the injury in spots corresponding to individual intercellular chambers.—WM. CROCKER.

Nitrogen fixation by Azotobacter.—HUTCHINSON,[12] in agreement with KOCH, REMY, and others, finds that the nitrogen content of sand or soil may be increased appreciably by the activity of *Azotobacter* when some suitable source of energy is supplied. Sugars proved very effective as an energy source, and distinct gains were obtained with plant residues. In pot cultures the nitrogen gains ran as high as 9 mg. of nitrogen per gram of plant residue added. Even in field cultures additions of sugar increased crop yields 20–54 per cent when conditions were favorable. HUTCHINSON believes the carbohydrates of plant residues act in a similar way in furthering nitrogen fixation and crop yields. For successful operation of this organism suitable temperature, the presence of phosphates, and a supply of basic material such as calcium carbonate are necessary. Besides these factors, some unknown conditions appear periodically in the soil, interfering with the action of this organism.

The effect of the addition of straw or other crop residues to the soil may be very complex. As important among these effects may be mentioned modification of physical condition of the soil, direct addition of nutrients (in the case of straw, considerable potash, little nitrogen as well as other nutrients), and the indirect addition of nitrogen through furnishing an energy source for *Azotobacter*.—WM. CROCKER.

Fucosan vacuoles.—HANSTEEN noted that granules, as he called them, accumulate about the chromatophores of Phaeophyceae during carbon assimilation. He thought they were produced by the chromoplasts and were the first visible product of carbon assimilation. On this basis he called them fucosan granules. KYLIN[13] has made a rather extensive study of these bodies, the results of which are summarized in the article here reviewed. He finds that these bodies are vacuoles rather than granules, and while they are probably formed by the chromoplast in connection with carbon assimilation, they are not made up in the main of carbon synthate. He thinks he has shown that dextrose is the first carbon synthate of the Phaeophyceae, and that this is condensed to lamanarin. These vacuoles may be the means by which the synthate leaves the plastid; but it is not stored in them. On the contrary, it rapidly diffuses from them into the cytoplasm. He thinks these vacuoles, especially the older ones, are filled with substances resembling tannin, but

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[12] HUTCHINSON, H. B., The influence of plant residues on nitrogen fixation and on losses of nitrate in the soil. Jour. Agric. Sci. **9**:92–111. 1918.

[13] KYLIN, HERALD, Über die Fucosanblasen der Phaeophyceen. Ber. Deutsch. Bot. Gesells. **36**:10–19. 1918.